

Fig 1

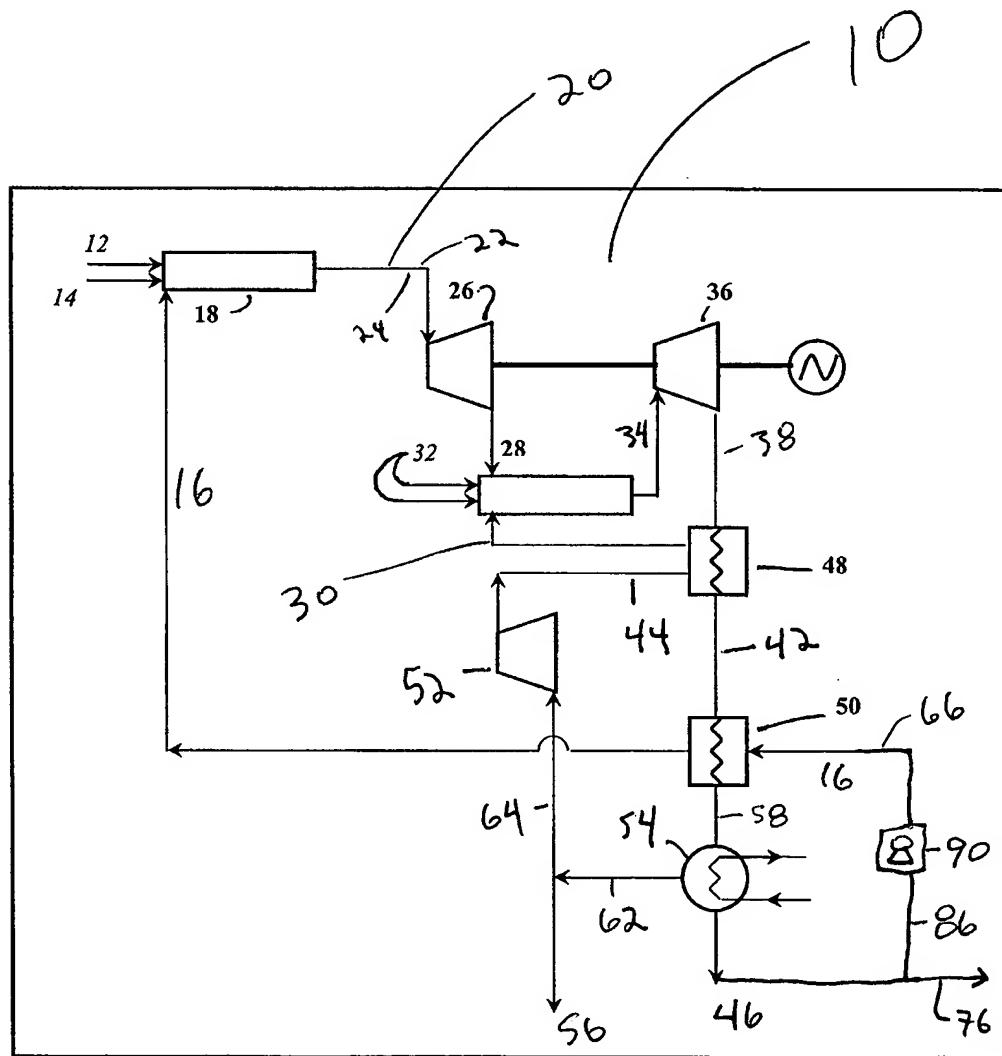
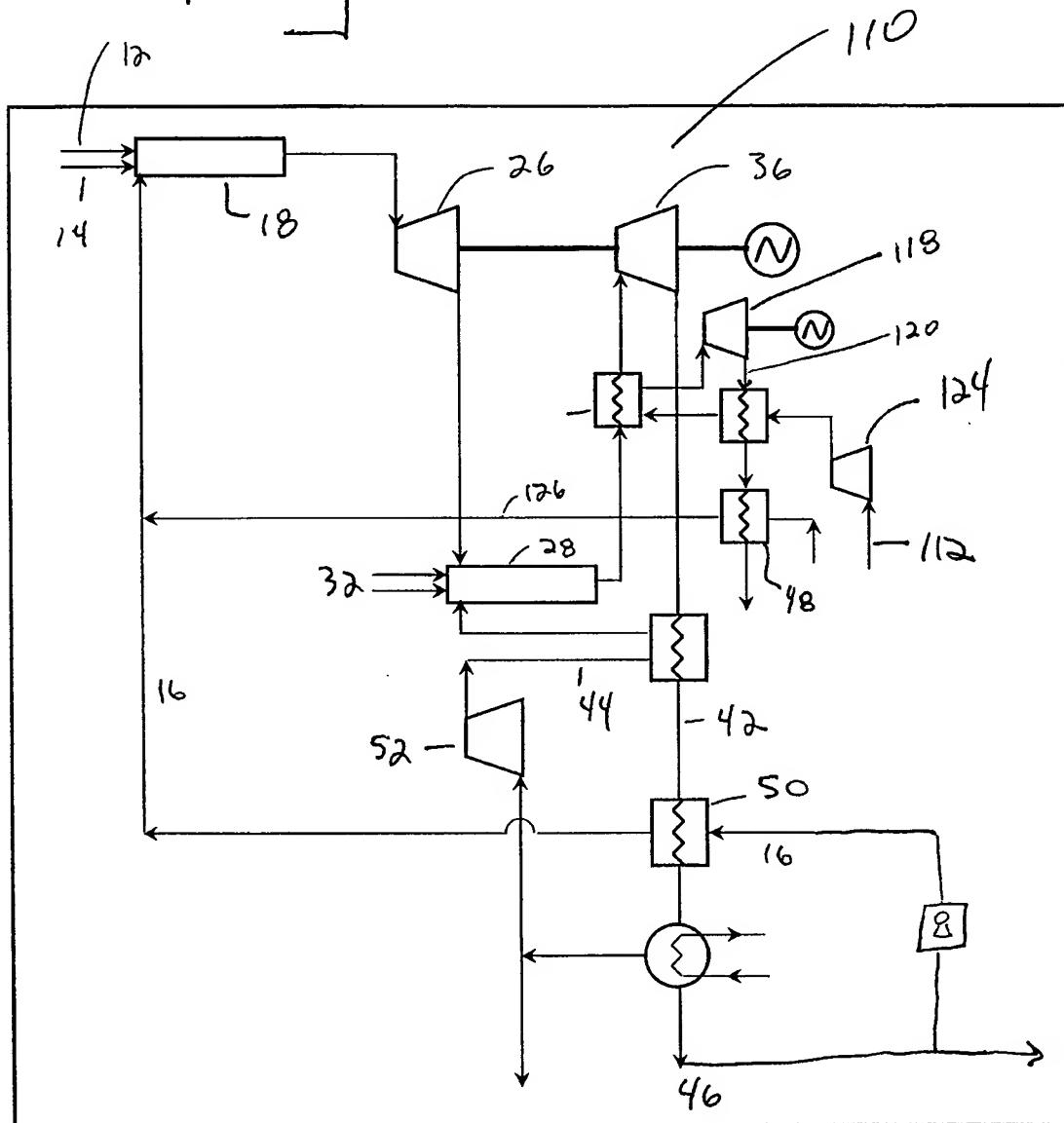


Fig. 2.



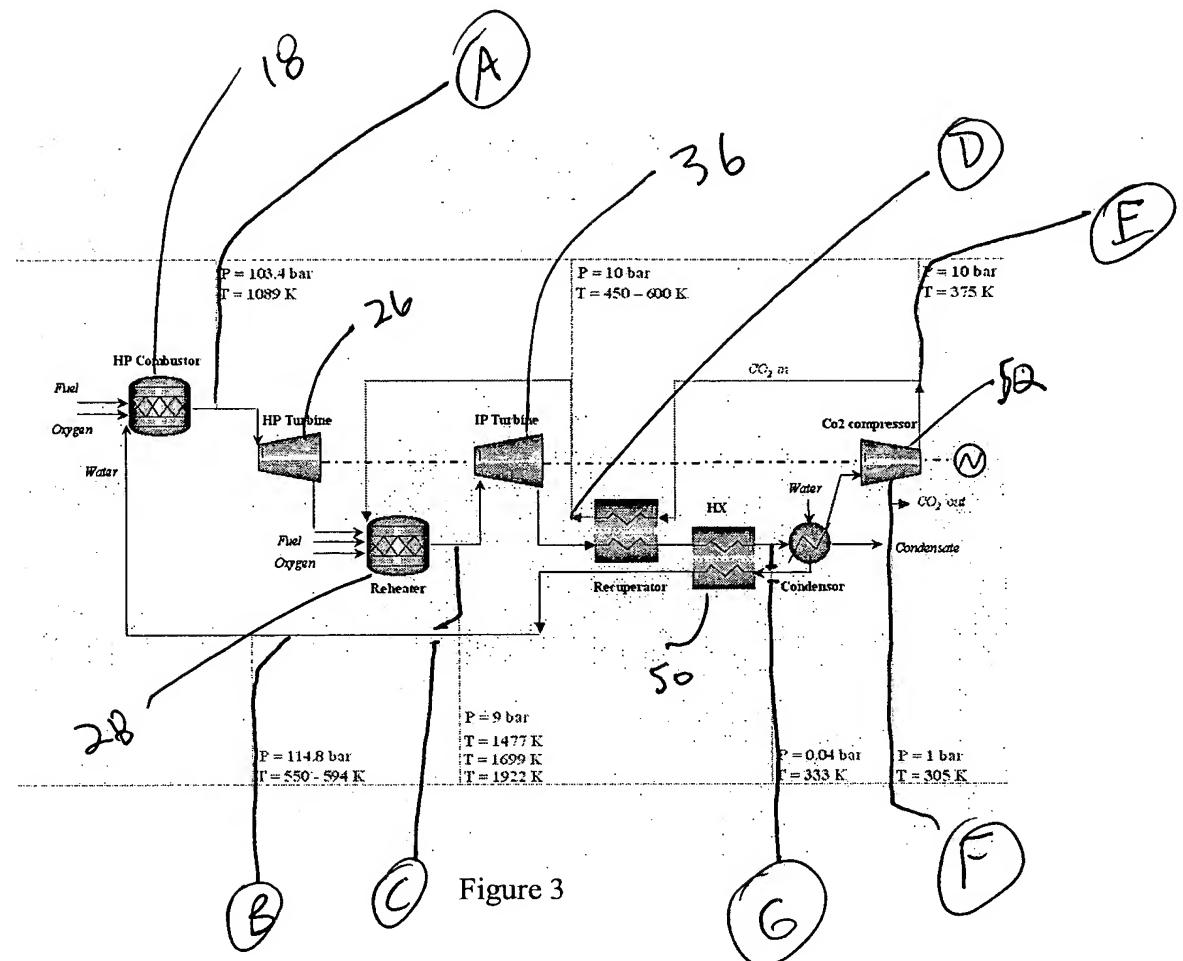


Figure 3

F 19

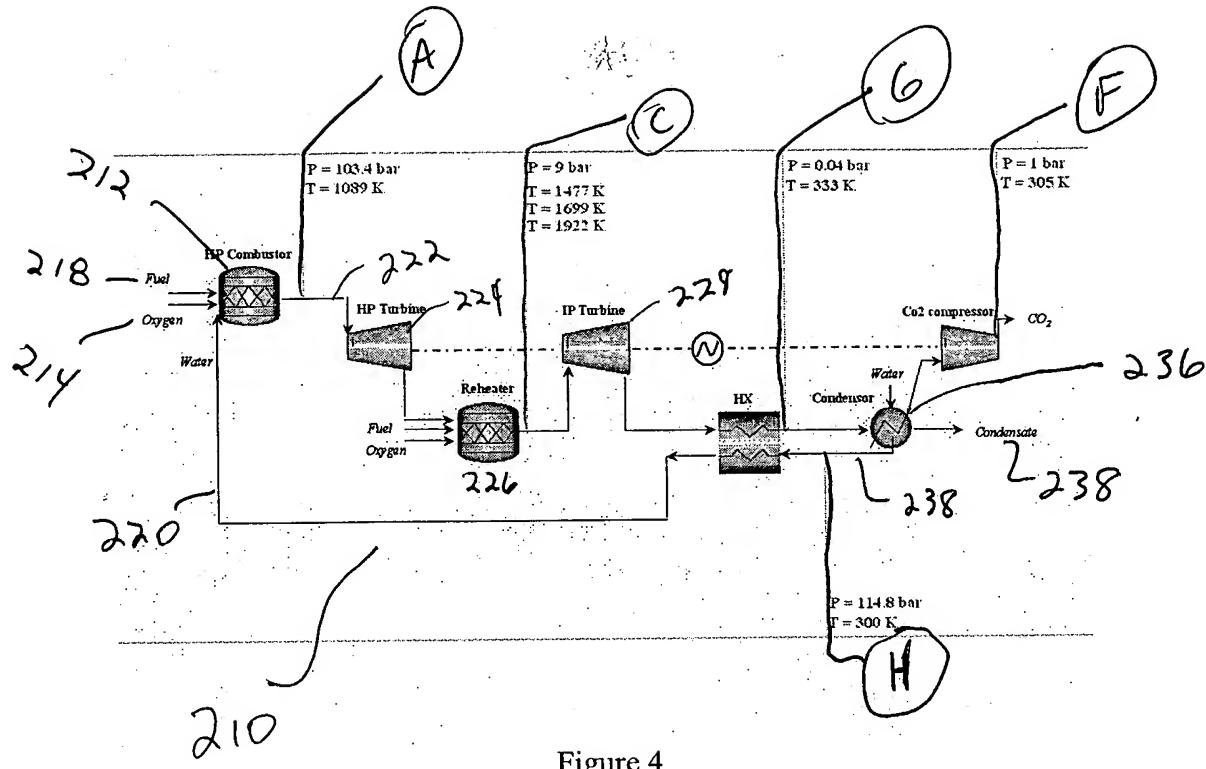


Figure 4

Fig 4

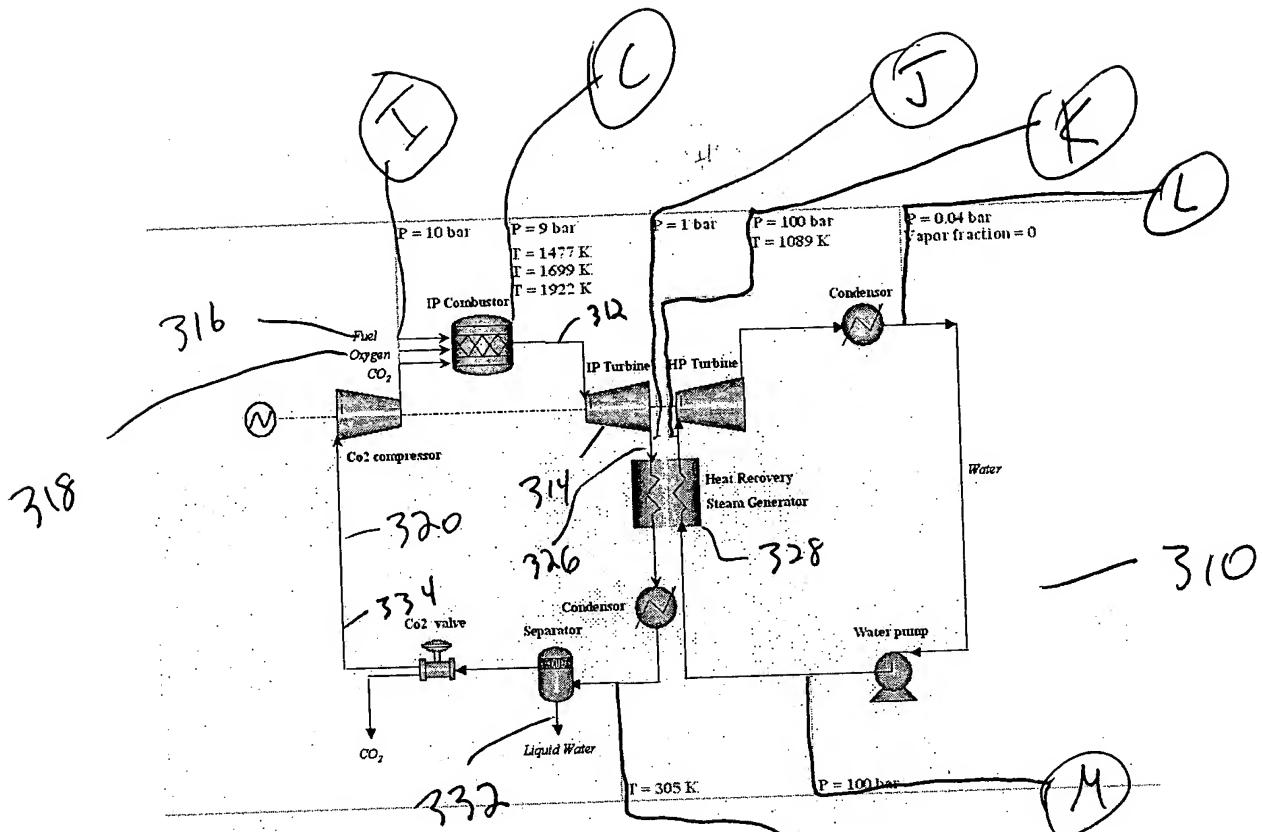


Figure 5.

F 5

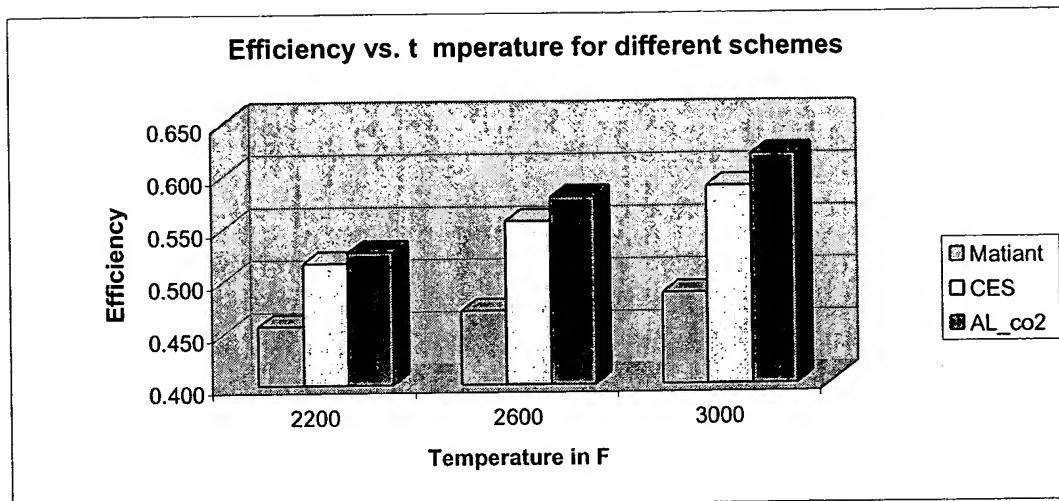


Figure 6

F 1 6

TABLE 7 -- Water Recycle

Fuel	CH4	HP c mbustor	
Temperature inlet	293 K	Pressure outlet	103.4 bar
Pressure inlet	12.41 bar	pressure drop	10%
		reaction	complete
Oxidant	O2	Q loss	0=adiabatic
Temperature inlet	293 K		
Pressure inlet	27.58 bar	Turb1=Steam turbine HP	
Fuel 2	CH4	method	isentropic
Temperature inlet	293 K	discharge pressure	10 bar
Pressure inlet	10 bar	isentropic efficiency	0.9
		Inlet temperature	1089 K
Oxidant 2	O2		
Temperature inlet	293 K	Reheater IP	
Pressure inlet	10 bar	Pressure outlet	9 bar
		pressure drop	10%
o2 &ch4 (HP) (IP)		reaction	complete
Mcompressors		Q loss	0=adiabatic
number of stage	4		
method	polytropic	Turb2=Gas turbine IP	
discharge pressure	(114.8) (10) bar	method	isentropic
isentropic efficiency	0.8	discharge pressure	0.04 bar
intercooling	90 F each stg expt last	isentropic efficiency	0.93
Pressure drop	0 psi	Inlet temperature	2200 2600 3000 F

TABLE 8 -- CO₂ Recycle

Gas turbin side		St am turbine sid
Fuel	CH4	Steam turbin
Temperature Inlet	293 K	method isentropic
Pressure inlet	10 bar	discharge pressure 0.04 Bar
Oxidant	O2	efficiency 0.9
Temperature inlet	293 K	Inlet temperature 1089 K
Pressure inlet	10 bar	
IP combustor		Condensor 2
Pressure outlet	9 bar	hot stream outlet vap frac=0 not taken into account
pressure drop	10%	Pressure drop
reaction	complete	
Q loss	0 W adiabatic	
Gas turbine		Separator 1
method	isentropic	temperature 305 K
discharge pressure	1 bar	pressure 1 bar
efficiency	0.93	Liquid entrainment 0
Inlet temperature	2200 2600 3000 F	
HRSG		Water pump
hot stream outlet	140 F	discharge pressure 2 bar
Pressure drop	not taken into account	efficiency 0.75
Condensor 1		
hot stream outlet	100 F	Water
Pressure drop	not taken into account	Temperature inlet 293 K
(Co2) Mcompressors		Pressure inlet 1 bar
number of stage	4	
method	polytropic	Circulation pump
discharge pressure	10 bar	discharge pressure 100 bar
efficiency	0.8	efficiency 0.75
intercooling	90 F each stg expt last	
Pressure drop	not taken into account	
Water pump		
discharge pressure	2 bar	
efficiency	0.75	
Water		
Temperature inlet	293 K	
Pressure inlet	1 bar	

TABLE 9 -- Preferred Embodiment

Fuel	CH4	HP combustor	
Temperature inlet	293 K	Pressure outlet	103.4 bar
Pressure inlet	12.41 bar	pressure drop	10%
		reaction	complete
Oxidant	O2	Q loss	0=adiabatic
Temperature inlet	293 K		
Pressure inlet	27.58 bar	Turb1=Steam turbine HP	
		method	isentropic
Fuel 2	CH4	discharge pressure	10 bar
Temperature inlet	293 K	isentropic efficiency	0.9
Pressure inlet	10 bar	Inlet temperature	1089 K
Oxidant 2	O2	Reheater IP	
Temperature inlet	293 K	Pressure outlet	9 bar
Pressure inlet	10 bar	pressure drop	10%
		reaction	complete
o2 & ch4 (HP) (IP)		Q loss	0=adiabatic
Mcompressors	4	Turb2=Gas turbine IP	
number of stage		method	polytropic
method		discharge pressure	(114.8) (10) bar
isentropic efficiency		isentropic efficiency	0.8
intercooling		intercooling	90 F each stg expt last
Pressure drop	0 psi	Inlet temperature	2200 2600 3000 F
CO2 Mcompressor			
number of stage	3		
method		polytropic	
discharge pressure	10 bar		
isentropic efficiency	0.8		
intercooling		90 F each stg expt last	
Pressure drop	0 psi		

Fuel	CH4	HP combustor	
Temperature inlet	293 K	Pressure outlet	103.4 bar
Pressure inlet	12.41 bar	pressure drop	10%
		reaction	complete
Oxidant	O2	Q loss	0=adiabatic
Temperature inlet	293 K		
Pressure inlet	27.58 bar	Turb1=Steam turbine HP	
		method	isentropic
Fuel 2	CH4	discharge pressure	10 bar
Temperature inlet	293 K	isentropic efficiency	0.9
Pressure inlet	10 bar	Inlet temperature	1089 K
Oxidant 2	O2	Reheater IP	
Temperature inlet	293 K	Pressure outlet	9 bar
Pressure inlet	10 bar	pressure drop	10%
		reaction	complete
o2 & ch4 (HP) (IP)		Q loss	0=adiabatic
Mcompressors	4	Turb2=Gas turbine IP	
number of stage		method	polytropic
method		discharge pressure	(114.8) (10) bar
isentropic efficiency		isentropic efficiency	0.8
intercooling		intercooling	90 F each stg expt last
Pressure drop	0 psi	Inlet temperature	2200 2600 3000 F

Vacuum 'pump' (Mcompressor)			
number of stage	4		
method		polytropic	
discharge pressure	1 bar		
isentropic efficiency	0.8		
intercooling		90 F each stage	
Pressure drop	0 psi		
HeatX1 = Condensor			
hot stream outlet		333 K	
Pressure drop			not taken into account
HeatX B1 = recuperator			
hot stream outlet		605 K	
Pressure drop			not taken into account
Air cooler			
hot stream outlet		295 K	
Pressure drop			0.04 bar
			not taken into account
co2 reheater			
hot stream outlet		326.6 K	
Pressure drop			not taken into account
Water pump			
discharge pressure	114.8 bar		
efficiency	0.75		
Wout pump			
discharge pressure	1 bar		
efficiency	0.75		
Water			
Temperature inlet	293 K		
Pressure inlet	1 bar		

TABLE 10 -- Comparison

Type of cycle	T HP	T IP	Final Pressure	M.F. CO2	M.F. CO2	Eff Without seq	Eff With seq
	F	F	Bar	flue gas	recycled		
matiant	1500	2200	1 & 0.04	0.930	0.916	0.456	0.438
matiant	1500	2600	1 & 0.04	0.914	0.893	0.471	0.452
matiant	1500	3000	1 & 0.04	0.868	0.897	0.487	0.468
CES	1500	2200	0.04	0.222	0.000	0.516	0.498
CES	1500	2600	0.04	0.234	0.000	0.556	0.537
CES	1500	3000	0.04	0.246	0.000	0.588	0.570
CO2 case2	1500	2200	0.04	0.805	0.890	0.527	0.509
CO2 case2	1500	2600	0.04	0.800	0.876	0.579	0.560
CO2 case2	1500	3000	0.04	0.785	0.856	0.618	0.599